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EVALUATION OF FUTURE PLANTING SITES ON THE MUNISING RANGER DISTRICT, HIAWATHA NATIONAL FOREST FOR SCLERODERRIS CANKER - 1979

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INTRODUCTION

Scleroderris canker, caused by Gremmeniella abietina (Lagerb.) Morelet, has resulted in widespread loss of red pine in New York and the Lake States. Two strains are recognized: the European strain, which kills trees of all ages, and the North American strain, which generally kills trees less than 2 m (6.6 ft) tall. The European strain has not yet been found in the Lake States, but the North American strain has been reported on red and jack pine in northeastern Minnesota and northern portions of Wisconsin and Michigan. It has been present on the Munising Ranger District at least since 1965.

Spread of Gremmeniella occurs both by rain-splashed conidia and wind-blown ascospores. If trees are not infected within 4 or 5 years after planting, they will probably not be killed by the North American strain of the disease. The distance between sources of inoculum (i.e., infected trees on which spores are produced) and young susceptible trees is a major factor in determining the risk of infection and death due to this disease.

OBJECTIVE

The objective of this survey was to determine the presence and severity of the North American strain of Gremmeniella on pines growing in the vicinity of sites on the Munising Ranger District that are scheduled to be planted with red or jack pine in the near future.

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METHODS

Two methods of evaluating the severity of scleroderris canker were used. The first involved field observations of red and jack pine within and bordering planting sites to be planted in 1979-82. If the canker was not detected there, host trees at progressively greater distances from the planting sites were checked for the canker up to 100 yd or until infected trees were located. The severity of infection in the area was estimated as: X = scleroderris canker not found; S = scattered (less than 5 percent of trees symptomatic); L = light (5-20 percent); M = medium (21-40 percent); and H = heavy (greater than 40 percent).

The second method involved an intensive evaluation of two young pine plantations in the vicinity of the future planting sites. Throughout each plantation, 1/750-acre plots were located at 1-chain intervals along parallel lines. The trees in each plot were classified as: (1) living and not infected with Gremmeniella; (2) living, but infected with Gremmeniella; (3) dead due to Gremmeniella; and (4) dead due to other causes. This survey provided a good estimate of both intensity of scleroderris canker and levels of stocking. Full stocking (100 percent) was assumed to be 750 trees per acre or one tree per plot. Percentage of stocking was determined by the ratio of total uninfected trees to total number of plots times 100.

Field identification of Gremmeniella infection was based on branch flagging, orange discoloration at the base of needles, green discoloration beneath the bark of dead branches, stem cankers, and the presence of black pycnidia or brown apothecia on dead twigs. At least three samples of suspected scleroderris canker from each infected stand were taken to the St. Paul Field Office for isolation and identification. Samples were labeled, put in plastic bags, and transported in ice chests kept cool with blue ice.

RESULTS

Scleroderris cankers caused by the North American strain of Gremmeniella were found at nearly all locations examined, but the fungus occurred mainly as a weak pathogen on lower branches of trees greater than 2 m tall. In several young pine plantations, however, high levels of infection and death due to scleroderris canker were found. These outbreaks were all within 2 miles of the jack pine plantation originally reported in 1978 as heavily infected with Gremmeniella (T45N, R18E, Sec 7). Of the 57 areas examined surrounding the 20 planting sites, Gremmeniella infection was not found in 14 percent. It was scattered in 10.5 percent, light in 44 percent, medium in 21 percent, and heavy in 10.5 percent of the areas. District personnel have been furnished with the locations of specific areas where Gremmeniella was found and its relative intensity in each location.

Results of the intensive evaluation surveys of the two young pine plantations are summarized in Table 1. The jack pine plantation, although heavily infected, will probably have sufficient stocking (currently 167 percent) to carry it through a full rotation. Stocking of the red pine plantation, however, has been greatly reduced (currently 24 percent) because of scleroderris canker.

Gremmeniella was isolated from symptomatic branches and needles. Two samples were confirmed by serology tests to be the North American strain of the fungus.

DISCUSSION

The widespread occurrence of scleroderris canker on the Munising Ranger District represents a threat to successful regeneration of pine in the area. The threat is especially severe near young pine plantations currently heavily infected with Gremmeniella because such plantations are sources of large quantities of spores which spread the fungus.

Factors influencing the potential severity of scleroderris canker are: (1) site characteristics, (2) distance and type of vegetation growing between sources of infection and areas to be regenerated, (3) susceptibility of the tree species to be planted, and (4) age of trees at time of infection.

Any factors that restrict the growth of young trees and therefore keep them in the susceptible size of less than 2 m tall increase the risk of loss due to this disease. These factors include low site index, drought, snow damage, and competition from other plants. In general, the lower the site, both topographically and in terms of site index, the greater the risk of scleroderris canker. Higher percentages of cankers are found on trees growing in depressions such as frost pockets.

An unplanted border strip (approximately 100 yd wide) between infected trees and newly planted pines will restrict the spread of the fungus into the planted area. A border strip containing resistant species (e.g., hardwoods, white spruce, balsam fir, white pine, or tamarack) will provide even greater protection.

Planting species that are less susceptible than red and jack pine can be a solution in areas of known Gremmeniella infection, but only if such species are suitable for the sites. Some varieties of Scots pine have shown resistance, but none has been sufficiently tested to deserve a recommendation for planting on a commercial scale at this time. In addition, Scots pine is quite susceptible to damage by many insects (e.g., pine root collar weevil, pales weevil, and European pine sawfly).

Elimination of sources of infection by burning or removing infected trees has not been very successful. Pruning lower branches (<2m high) of large red and jack pines bordering planting sites, however, may eliminate infected branches on which spores can be produced.

RECOMMENDATIONS

The general management options for dealing with this disease have been discussed above. The following specific recommendations should be included in plans for areas where scleroderris canker is a threat to successful regeneration of pine:

1) do not replant or interplant plantations with susceptible pines where trees have been lost due to scleroderris canker;
2) do not plant susceptible species adjacent to heavily infected plantations;
3) remove infected residual trees in the centers of planting sites since they may serve as sources of inoculum;
4) manage plantations so that trees will attain a height of 2 m in the shortest length of time (e.g., intensive site preparation, control of competing vegetation, fertilization);
5) leave an unplanted border strip around newly-planted pines or plant border strips with non-susceptible tree species.

Table 1.-- Incidence of scleroderris canker in two pine plantations on the Munising Ranger District, Hiawatha National Forest

Host condition	Plantation A[a/]		Plantation B[b/]	
	Number of trees	Percentage	Number of trees	Percentage
Living				
Not infected	130	54.1	25	20.0
Scleroderris	79	33.0	59	47.2
Dead due to:				
Scleroderris	27	11.3	28	22.4
Other	4	1.6	13	10.4
Total	240	100	125	100
Stocking[c/]	-	167	-	24

a/ T46N, R18W, Sec 32, Stand 14: jack pine (3-6 ft tall); based on 78 1/750-acre plots.
b/ T45N, R18W, Sec 7, NE1/4, SW of Rd. 2332; red pine (2-4 ft tall); based on 103 1/750-acre plots.
c/ Stocking based on ratio of uninfected living trees to number of plots.